Solar System Research 1999 vol.33 N1, pages 71-76

A numerical investigation of motion near the lagrangian points of the sun-saturn system

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Abstract

The motion of test particles near the Lagrangian triangular points of the Sun-Saturn system are studied by the numerical integrations of the equations of motion. The three-dimensional, elliptic, restricted seven-body problem is considered (for the bodies are the Sun, five outer planets, and a small body). It is shown that tadpole orbits points break down in close neighborhood of the Lagrangian on a timescale of 100 kyr. The regions of stable libration oscillations at t ~ 100 kyr have an annular shape. Motion in tadpole orbits persists over at least 100 kyr at ΔH - 20° and Δr ≈ ±0.1-0.2 AU, where Δr is the heliocentric-distance difference between the particle and the Lagrangian point, ΔH is the angle between the direction to the libration point and the direction to the particle at the initial moment.